attendants, describes how the messenger was sent to Yarkand, and how, contrary to his own advice, M. Schlagintweit determined on going there. He says that on their approach to Yarkand they were treated with courtesy, receiving and giving presents. Thence they went to Kashgar, which was occupied by a Khojah of Kokan, who had installed himself in the city with his Mussulman troops; but the army of Khutta was in the field, besieging him, and every day there was a fight. The Khojah's people "asked who we were? M. Schlagintweit replied, that he was the Hon. East India Company's envoy, and was going to the Khan of Kokan; upon this they got into a rage, and ordered M. Schlagintweit to be beheaded, and I, with my followers, to be thrown into prison, and plundered of all our property." After thirty-five days the army of Khutta overpowered the Khojah and forced him to fly, and the informant was released.

The Second Paper read was:—

2. *On a New Projection of the Sphere.*

By Sir J. F. W. HERSCHEL, Bart., D.C.L., F.R.S., &c.

MY DEAR SIR RODERICK,—As President of the Royal Geographical Society, the Paper which I herewith send, may interest you. It contains an account of a projection of the sphere, so far as I am aware new, which offers several peculiar advantages for geographical purposes when the whole, or at least the whole accessible part of the globe has to be mapped down on one sheet. For, 1st, it gets rid of the extravagant distension in high latitudes, at least on one side of the equator, which the Mercator projection necessitates. 2nd. Like that and the stereographic projection, it exhibits all small portions of the sphere in their true forms without *distortion* of figure. 3rd. It exhibits large portions (as whole continents) with very much less variation of scale where great amplitudes are concerned than the stereographic, and for the whole of one hemisphere than the Mercator; while for the other, as far as the 50th deg. of latitude, it is no way offensive. 4th. It takes in at one view the whole accessible surface; and, what no other circular projection can do, it allows on one and the same plate a repetition of the map, or of any portion of it continuously right and left; so that, take what meridian you will for a prime meridian, it will, by merely placing that meridian upright before the spectator, give an equally convenient and natural *coup-d'œil* of at least 90°, or if it be preferred

180° on either side of it, and thus affords, what no other projection does, an equally clear and perspicuous representation, not only of the Indian, Atlantic, and Pacific Oceans, and the whole of the old and new Continents and Australia, but also of the North Polar basin —somewhat unduly enlarged, it is true, but exhibiting the whole coast-line infinitely less disfigured than in the Mercator charts.

The projection in question having been the direct result of a general mathematical inquiry into the subject, suggested by the consideration of Colonel James's recent projection, which takes in more than a hemisphere, I subjoin the steps of the investigation which led to it. Colonel James's projection takes in at the very extreme theoretical limit only about 132° of amplitude from the centre to the circumference of the map, or five-sixths of the face of the sphere; and even when restricted to 110° of amplitude, or two-thirds of the sphere, though very elegant and pleasing in effect as a picture, yet gives a very considerable amount of distortion of shape at the borders. The sketch marked (A) includes an amplitude of 160° of North Polar distance, or 97-100ths of the whole surface of the globe, and exhibits no *distortion*, and on the whole no more variation in the *scale* in the representation of areas for areas, than can very well be tolerated.

Should you consider this a fitting communication for the Geographical Society, I will beg the favour of your laying it before them; and meanwhile permit me to remain, my dear Sir Roderick,

Very faithfully yours,

J. F. W. HERSCHEL.

In this paper the author investigates the general mathematical expression for the co-ordinates of any point in the projection in terms of the co-ordinates of the corresponding point on the sphere. The condition, that any infinitesimal rectangle on the sphere and its projection must be similar, leads to a differential partial equation of the second order, the solution of which gives rise to two arbitrary functions, entering into the expressions for the co-ordinates of the projected point.

These functions "being subject to no restriction, it is evident that we may superadd to the general conditions of the problem any which will suffice either to determine altogether or to limit the generality of the arbitrary functions in the view of obtaining convenient forms of projected representation. Suppose, for instance, we assume, as a condition, that the projected representations of all circles about a fixed pole on the sphere shall be concentric circles

about a fixed centre on the plane." The author then shows, that on such a supposition, "if p be the polar distance of any parallel of latitude, and θ the radius of the circular segment representing that parallel, we have (taking 1 for the equatorial radius in the projection) $\theta = \left(\tan\frac{p}{2}\right)^n$, from which it is easy to calculate θ for each polar distance from 0° to 180°. This expression, it will be observed, still contains one arbitrary quantity, n. By giving specific values to n, we have various projections including and analogous to the stereographic. The author then calculates a table of values for the radii in the projection for the polar distances 0°, 10°, 20°, &c.—160°; for the values of n, 1, $\frac{2}{3}$, $\frac{1}{2}$, $\frac{1}{3}$.

"The *first* series of numbers," he concludes, "exhibits the progression of the radii of the successive projected parallels in the stereographic projection. The *second*, in that which occupies a section of 240°, such as by cutting out the unoccupied portion, would roll into a cone, well adapted for a transparent map on a lamp-shade. The *third* is that which occupies a semicircle—a convenient form for a reference-chart, but which becomes too much dilated beyond the 55th parallel of south latitude; and the *last*, that comprised in a sector of 120°, which is preferable to either, and seems to me not unlikely to supersede all other projections for a general chart."

Numerical Values of θ in the above Equation, when $n = \frac{1}{3}$.

$p =$	0°	10°	20°	30°	40°	50°	60°	70°	80°
$\theta =$	0·00	0·444	0·561	0·645	0·714	0·776	0·833	0·888	0·943
$p =$	90°	100°	110°	120°	130°	140°	150°	160°	
$\theta =$ *	1·000	1·060	1·126	1·201	1·290	1·401	1·551	1·783	

* The general question has been also discussed by Gauss in an answer to the prize question proposed by the Royal Society of Copenhagen in 1822. His method is, in some respects, still more general than that of the present paper; but, although he arrives at, amongst others, an equivalent to the formula given above, or, rather, to that from which it was obtained, viz., $r = 2.\sqrt{2}.\left(\tan\frac{90-y}{2}\right)^n$, he does not particularly specify the "lamp-shade" projection, nor those represented by the third and the fourth cases.

In two memoirs, published in the Comm. Gott., vols. ii. and iii., the same author examines in considerable detail the projection of a spheroid on a sphere.—*Note communicated by* F. G.

The PRESIDENT.—The Society must appreciate highly any communication upon physical geography from so eminent an authority as Sir John Herschel. On this occasion he shows that this projection presents a more accurate representation of the world in one sphere than any other stereographic projection. It is not only more accurate than that of Mercator, but is, he suggests, more correct than the ingenious projection prepared by our associate Col. James, with which you may now compare it.

(The diagrams prepared by Sir John Herschel and those of Col. James were then exhibited to the Meeting.)

The Third Paper read was:—

3. *Remarks on the Isthmus of Suez, with Special Reference to the proposed Canal.* By COMMANDER BEDFORD PIM, R.N., F.R.G.S.

DURING a visit to Egypt in December last, my attention was forcibly drawn to a subject that has for the past few years engaged a considerable amount of public interest—the cutting a canal across the Isthmus of Suez.

While in Cairo I had the advantage of making the acquaintance of gentlemen well qualified, both from local and professional knowledge, to form a dispassionate opinion on this much-vexed question, and I now propose to review the subject in its various bearings, so as to enable the Society to form an independent judgment of its merits.

I shall begin with describing the geographical position and physical features of the country, then detail the attempts of the Ancients at canalization, and conclude with a narration of the various plans and projects which have been proposed in modern times.

Egypt, of which the Isthmus of Suez is a component part, lies between the 29th and 33rd degrees of E. long., and in both these meridians is bounded by sandy deserts. On the north is the Mediterranean, in the 31st parallel of north latitude, while to the south of parallel 23° is the boundary line. On the south-east the waters of the Red Sea wash the coast and form the roadstead of Suez, whence to Pelusium, namely the "Isthmus," the distance is only 65 geographical or 74 statute miles; Suez being situated in 29° 58′ 37″ N. lat., Tineh, the ancient Pelusium, in 31° 3′ 37″ N. lat.

The northern or Mediterranean coast presents a barren appearance, and consists of low sandy hillocks and swamps. Excepting Alexandria, no sort of harbour for vessels of any size exists. The water in the vicinity of the land is shallow, the bottom shelving very gradually towards the beach, especially so in the Bay of Tineh or Pelusium, where the depth of 25 feet averages a distance